Subchapter IV — Radiation Safety Requirements for Industrial Radiographic Operations

HFS 157.35 Exemptions. Industrial uses of hand−held imaging intensification devices are exempt from the requirements of this subchapter if the dose rate 0.45 meters (18 inches) from the source of radiation to any individual does not exceed .02 mSv (2.0 mR) per hour. Industrial x−ray tubes are exempt from the inventory, leak testing and materials labeling requirements of this subchapter. All other requirements apply.
History: CR 01−108: cr. Register July 2002 No. 559, eff. 8−1−02.

HFS 157.36 Performance requirements for industrial radiography equipment.

(1) EQUIPMENT. Equipment used in industrial radiographic operations shall meet all the following minimum criteria:
(a) Except as provided in sub. (2), each radiographic exposure device, source assembly or sealed source and all associated equipment shall meet the requirements specified in ANSI N432−1980 "Radiological Safety for the Design and Construction of Apparatus for Gamma Radiography".
Note: The publication ANSI N432−1980 "Radiological Safety for the Design and Construction of Apparatus for Gamma Radiography" published by the ANSI, may be consulted at the Department of Health and Family Services, Radiation Protection Section, 1 West Wilson St, Room 150, Madison WI 53702−0007 or at the Secretary of State's Office or the Revisor of Statutes Bureau.
1. A licensee shall ensure that each radiographic exposure device has attached to it a durable, legible, clearly visible label bearing all the following information:
a. Chemical symbol and mass number of the radionuclide in the device.
b. Activity and the date on which activity was last measured.
c. Model or product code and serial number of the sealed source.
d. Name of the manufacturer of the sealed source.
e. Licensee's name, address and telephone number.
2. Radiographic exposure devices intended for use as type B packages shall meet the applicable transportation requirements of subch. XIII.
3. Modification of radiographic exposure devices, source changers and source assemblies and associated equipment is prohibited, unless the design of any replacement component, including source holder, source assembly, controls or guide tubes would not compromise the design safety features of the system.
(b) The following additional requirements apply to radiographic exposure devices, source assemblies and associated equipment that allow the source to be moved out of the device for radiographic operations or to source changers:
1. The coupling between the source assembly and the control cable shall be designed so that the source assembly will not become disconnected if cranked outside the guide tube. The coupling shall be constructed so that it cannot be unintentionally disconnected under normal and reasonably foreseeable abnormal conditions.
2. The device must automatically secure the source assembly when it is cranked back into the fully shielded position within the device. This securing system may only be released by means of a deliberate operation on the exposure device.
3. The outlet fittings, lock box and drive cable fittings on each radiographic exposure device shall be equipped with safety plugs or covers installed during storage and transportation to protect the source assembly from water, mud, sand or other foreign matter.
4. Each sealed source or source assembly shall have attached to it or engraved on it a durable, legible, visible label with the words: "DANGER ── RADIOACTIVE."
5. The label in subd. 4. may not interfere with the safe operation of the exposure device or associated equipment.
6. The guide tube shall be able to withstand a crushing test that closely approximates the crushing forces that are likely to be encountered during use and be able to withstand a kinking resistance test that closely approximates the kinking forces that are likely to be encountered during use.
7. Guide tubes shall be used when moving the source out of the device.
8. An exposure head or similar device designed to prevent the source assembly from passing out of the end of the guide tube shall be attached to the outermost end of the guide tube during industrial radiography operations.
9. The guide tube exposure head connection shall be able to withstand the tensile test for control units specified in ANSI N432 − 1980.
10. Source changers shall provide a system for ensuring that the source will not be accidentally withdrawn from the changer when connecting or disconnecting the drive cable to or from a source assembly.
(c) All radiographic exposure devices and associated equipment in use after January 10, 1996 shall comply with the requirements of this section.
(2) EXCEPTION. Equipment used in industrial radiographic operations need not comply with 6.6.2 of the Endurance Test in ANSI N432 − 1980 "Radiological Safety for the Design and Construction of Apparatus for Gamma Radiography" if the prototype equipment has been tested using a torque value representative of the torque that an individual using the radiography equipment may reasonably exert on the lever or crankshaft of the drive mechanism.
Note: The publication N432 1980 "Radiological Safety for the Design and Construction of Apparatus for Gamma Radiography", ANSI, published by the ANSI, may be consulted at the Department of Health and Family Services, Radiation Protection Section, 1 West Wilson St, Room 150, Madison WI 53702−0007 or at the Secretary of State's Office or the Revisor of Statutes Bureau.
History: CR 01−108: cr. Register July 2002 No. 559, eff. 8−1−02; **CR 06−021: am. (1) (a) (intro.), 1. (intro.), 3., (b) 9. and (2) Register October 2006 No. 610, eff. 11−1−06**.

HFS 157.37 Radiation safety requirements for storage containers and source changers.

(1) MAXIMUM EXPOSURE RATE LIMITS. The maximum exposure rate limits for storage containers and source changers are 2 millisieverts (200 mrem) per hour at any exterior surface and 0.1 millisieverts (10 mrem) per hour at one meter from any exterior surface with the sealed source in the shielded position.

(2) LOCKING. (a) A radiographic exposure device shall have a lock or outer locked container designed to prevent unauthorized or accidental removal of the sealed source from its shielded position. The exposure device and its container shall be kept locked when not under direct surveillance by a radiographer or a radiographer's assistant, except at permanent radiographic installations. If a keyed lock, the key shall be removed at all times except to open or close the lock on the device or container. In addition, during radiographic operations the sealed source assembly shall be secured in the shielded position each time the source is returned to that position.

(b) Each sealed source storage container and source changer shall have a lock or outer locked container designed to prevent unauthorized or accidental removal of the sealed source from its shielded position. Storage containers and source changers shall be kept locked when containing sealed sources except when under the direct surveillance of a radiographer or a radiographer's assistant. If a keyed lock, the key shall be removed at all times.

(c) The control panel of all portable radiation machines shall be equipped with a lock that will prevent the unauthorized use of an x−ray system or the accidental production of radiation. The radiation machine shall be kept locked and the key removed at all times except when under the direct visual surveillance of a radiographer or a radiographer's assistant.

History: CR 01−108: cr. Register July 2002 No. 559, eff. 8−1−02.

HFS 157.38 Radiation survey instruments.

(1) REQUIREMENT. A licensee shall keep sufficient calibrated and operable radiation survey instruments at each location where sources of radiation are present to make the radiation surveys required by this subchapter and subch. III. Instrumentation required by this subchapter shall be capable of measuring a range from 0.02 millisieverts (2 mrem) per hour through 0.01 sievert (1 rem) per hour.

(2) CALIBRATION. (a) A licensee shall have each radiation survey instrument calibrated for all the following:

1. At energies appropriate for use and at intervals not to exceed 6 months or after instrument servicing, except for battery changes.
2. For linear scale instruments, at 2 points located approximately one−third and two−thirds of full scale on each scale; for logarithmic scale instruments, at mid−range of each decade and at 2 points of at least one decade; and for digital instruments at 3 points between 0.02 and 10 millisieverts (2 and 1000 mrem) per hour.

(b) Accuracy within plus or minus 20% of the true radiation dose rate shall be demonstrated at each point checked.

History: CR 01−108: cr. Register July 2002 No. 559, eff. 8−1−02.

HFS 157.39 Leak testing and replacement of sealed sources.

(1) AUTHORIZATION.

(a) The replacement of any sealed source fastened to or contained in a radiographic exposure device and leak testing of any sealed source shall be performed by persons authorized to do so by the department, the nuclear regulatory commission or another agreement state.

(b) The opening, repair or modification of any sealed source shall be performed by persons specifically authorized to do so by the department, the nuclear regulatory commission or another agreement state.

(2) LEAK TESTING AND RECORD KEEPING REQUIREMENTS.

(a) A licensee who uses a sealed source shall have the source tested for leakage at intervals not to exceed 6 months. The leak testing of the source shall be performed using a method approved by the department, the nuclear regulatory commission or by another agreement state. The wipe sample should be taken from the nearest accessible point to the sealed source where contamination might accumulate. The wipe sample shall be analyzed for radioactive contamination. The analysis shall be capable of detecting the presence of 185 becquerel (0.005 μCi) of radioactive material on the test sample and shall be performed by a person specifically authorized by the department, the US nuclear regulatory commission or another agreement state to perform the analysis.

(b) A licensee shall maintain records of the leak tests for 3 years.

(c) Unless a sealed source is accompanied by a certificate from the transferor that shows that it has been leak tested within 6 months before the transfer, it may not be used by the licensee until tested for leakage. Sealed sources that are in storage and not in use do not require leak testing, but shall be tested before use or transfer to another person if the interval of storage exceeds 6 months.

(d) Any leak test that reveals the presence of 185 becquerel (0.005 μCi) or more of removable radioactive material shall be considered evidence that the sealed source is leaking. The licensee shall immediately withdraw the equipment involved from use and shall have it decontaminated and repaired, or disposed of. A report must be filed with the department within 5 days of any test with results that exceed the threshold in this paragraph, describing the equipment involved, the test results and the corrective action taken.

(e) 1. Each exposure device using depleted uranium shielding and an "S" tube configuration shall be tested for DU contamination at intervals not to exceed 12 months. The analysis shall be capable of detecting the presence of 185 becquerel (0.005 μCi) of radioactive material on the test sample and shall be performed by a person specifically

authorized by the department, the nuclear regulatory commission or another agreement state to perform the analysis. If the testing reveals the presence of DU contamination, the exposure device shall be removed from use until an evaluation of the wear of the S−tube has been made. If the evaluation reveals that the S−tube is worn through, the device may not be used again.
2. DU shielded devices need not be tested for DU contamination while not in use and in storage. If the DU shielded device has not been used and in storage for more than 12 months, the device shall be tested for DU contamination before using or transferring the device. A record of the DU leak−test shall be retained for 3 years.
History: CR 01−108: cr. Register July 2002 No. 559, eff. 8−1−02.

HFS 157.40 Quarterly inventory.

(1) REQUIREMENT. A licensee shall conduct a quarterly physical inventory to account for all sources of radiation and for devices, including devices containing depleted uranium, received and possessed under the license.
(2) RECORDS. A licensee shall maintain records of the quarterly inventory for 3 years. The record shall include the date of the inventory, name of the individual conducting the inventory, radionuclide, source activity in becquerels or curies or mass of DU in each device, location of the sources and devices, manufacturer, model and serial number of each source of radiation.
History: CR 01−108: cr. Register July 2002 No. 559, eff. 8−1−02.

HFS 157.41 Inspection and maintenance of radiation machines, radiographic exposure devices, transport and storage containers, associated equipment, source changers and survey instruments.

(1) INSPECTION REQUIREMENTS.
(a) A licensee or registrant shall perform visual and operability checks on survey meters, radiation machines, radiographic exposure devices, transport and storage containers, associated equipment and source changers before each day's use or work shift, to ensure that all the following applies:
1. The equipment is in good working condition.
2. The sources are adequately shielded.
3. Required labeling is present.
(b) Survey instrument operability shall be performed using check sources or other appropriate means.
(c) If equipment problems are found, the equipment shall be removed from service until repaired.
(2) PROCEDURES. (a) A licensee or registrant shall perform inspection and routine maintenance of radiation machines, radiographic exposure devices, source changers, associated equipment, transport and storage containers and survey instruments at intervals not to exceed 3 months or before the first use thereafter to ensure the proper functioning of components important to safety. Replacement components shall meet design specifications. A licensee or registrant shall utilize written inspection and maintenance procedures. If equipment problems are found, the equipment shall be removed from service until repaired.
(b) A licensee's inspection and maintenance program shall include procedures to assure that type B packages are shipped and maintained under the certificate of compliance or other approval. A program for transport container inspection and maintenance limited to radiographic exposure devices, source changers or packages transporting these devices and meeting the requirements of this subsection or equivalent NRC or agreement state requirements, shall satisfy the requirements of s. HFS 157.94 (6).
(c) Records of equipment problems and of any maintenance performed shall be retained for 3 years.
History: CR 01−108: cr. Register July 2002 No. 559, eff. 8−1−02; **CR 06−021: am. (2) (a) Register October 2006 No. 610, eff. 11−1−06**.

HFS 157.42 Permanent radiographic installations.

(1) ENTRY REQUIREMENTS. Each entrance that is used for personnel access to the high radiation area in a permanent radiographic installation shall have either of the following:
(a) An entrance control of the type described in s. HFS 157.26
(1) (a) 1. that causes the radiation level upon entry into the area to be reduced.
(b) Both conspicuous visible and audible warning signals to
warn of the presence of radiation. The visible signal shall be actuated by radiation whenever the source is exposed or the machine is energized. The audible signal shall be actuated when an attempt is made to enter the installation while the source is exposed or the machine is energized. The alarm system shall be tested for proper operation with a radiation source each day before the installation is used for radiographic operations. The test shall include a check of both the visible and audible signals. Entrance control devices that reduce the radiation level upon entry shall be tested monthly.
(2) DEVICE FAILURE. If an entrance control device or an alarm
is operating improperly, it shall be immediately labeled as defective and repaired within 7 calendar days. The facility may continue to be used during this 7−day period provided the licensee or registrant implements continuous surveillance and uses an alarming ratemeter. Test records for entrance controls and audible and visual alarms shall be maintained for 3 years.
History: CR 01−108: cr. Register July 2002 No. 559, eff. 8−1−02; **CR 06−021: am. (1) (a) Register October 2006 No. 610, eff. 11−1−06**.

HFS 157.43 Labeling, transportation and storage.

(1) LABELING REQUIREMENTS. A licensee may not use a source changer or a container to store radioactive material unless the source changer or the storage container has securely attached to it a durable, legible and clearly visible label bearing the standard trefoil radiation caution symbol with conventional colors, which is magenta, purple or black on a yellow background, having a minimum diameter of 25 millimeters and the wording:

CAUTION (or DANGER)
RADIOACTIVE MATERIAL
NOTIFY CIVIL AUTHORITIES
[or "NAME OF COMPANY"]

(2) TRANSPORT. A licensee may not transport radioactive material unless the material is packaged and the package is labeled, marked and accompanied with appropriate shipping papers under regulations set out in subch. XIII.

(a) A licensee shall lock and physically secure the transport package containing radioactive material in the transporting vehicle to prevent accidental loss, tampering or unauthorized removal.

(b) A licensee's or registrant's name and city or town where the main business office is located shall be prominently displayed with a durable, clearly visible label or labels on both sides of all vehicles used to transport radioactive material or radiation machines for temporary job site use.

(3) STORAGE. Radiographic exposure devices, source changers, storage containers and radiation machines, shall be physically secured to prevent tampering or removal by unauthorized personnel. The licensee shall store radioactive material in a manner that minimizes danger from explosion or fire.

History: CR 01−108: cr. Register July 2002 No. 559, eff. 8−1−02.

HFS 157.44 Operational radiation safety requirements.

(1) CONDUCTING INDUSTRIAL RADIOGRAPHIC OPERATIONS.

(a) Whenever radiography is performed at a location other than a permanent radiographic installation, the radiographer shall be accompanied by at least one other certified radiographer or radiographer's assistant. The additional individual shall observe the operations and be capable of providing immediate assistance to prevent unauthorized entry. Radiography may not be performed if only one individual is present.

(b) Except when physically impossible, collimators shall be used in industrial radiographic operations that use radiographic exposure devices that allow the source to be moved out of the device.

(c) A licensee may conduct lay−barge, offshore platform or underwater radiography only if procedures have been approved by the department, the NRC or by another agreement state.

(2) RADIATION SAFETY OFFICER.

(a) The radiation safety officer shall ensure that radiation safety activities are being performed under approved procedures and regulatory requirements in the daily operation of the licensee's or registrant's program.

(b) Except as allowed in par. (c), the minimum qualifications, training and experience for radiation safety officers for industrial radiography are as follows:

1. Completion of the training and testing requirements of sub. (3) (a) and (b).
2. 2000 hours of hands−on experience as a qualified radiographer in industrial radiographic operations.
3. Formal training in the establishment and maintenance of a radiation protection program.

(c) The department may consider alternatives to the requirements of par. (b) when the radiation safety officer has appropriate training and experience in the field of ionizing radiation and has adequate formal training with respect to the establishment and maintenance of a radiation safety protection program.

(d) The specific duties and authorities of the radiation safety officer shall include all the following:

1. Establishing and overseeing all operating, emergency and ALARA procedures as required by subch. III and reviewing the procedures regularly to ensure that the procedures conform to department rules and to the license conditions.
2. Overseeing and approving the training program for radiographic personnel to ensure that appropriate and effective radiation protection practices are taught.
3. Ensuring that required radiation surveys and leak tests are performed and documented under the rules, including any corrective measures when levels of radiation exceed established limits.
4. Ensuring that personnel monitoring devices are calibrated, if applicable, and used properly; that records are kept of the monitoring results; and that timely notifications are made as required by subch. III.
5. Ensuring that operations are conducted safely and implementing corrective actions including terminating operations at the work sites or upon license termination.

(3) TRAINING. (a) In addition to the requirements in par. (b), a licensee or registrant may not permit any individual to act as a radiographer until the individual has completed a minimum of 40 hours of training in the subjects outlined in this paragraph, hands−on experience under the supervision of a radiographer and is certified through a radiographer certification program meeting the requirements of 10 CFR 34 Appendix A. The hands−on experience for radioactive materials shall include a minimum of 320 hours of active participation in the performance of industrial radiography utilizing radioactive material or 160 hours of active participation in the performance of industrial radiography if utilizing only radiation machines. Individuals performing industrial radiography utilizing radioactive materials and radiation machines shall complete both segments of the hands−on experience for a minimum of 480 hours. A licensee or registrant shall include all the following subjects in training:

1. Fundamentals of radiation safety that includes all of the following:
a. Characteristics of gamma and x−ray radiation.
b. Units of radiation dose and quantity of radioactivity.
c. Hazards of exposure to radiation.
d. Levels of radiation from sources of radiation.
e. Methods of controlling radiation dose via time, distance and shielding.
2. Radiation detection instruments that includes all of the following:
a. Use, operation, calibration and limitations of radiation survey instruments.
b. Survey techniques.
c. Use of personnel monitoring equipment.
3. Equipment to be used that includes all of the following:
a. Operation and control of radiographic exposure equipment, remote handling equipment and storage containers, including pictures or models of source assemblies.
b. Operation and control of radiation machines.
c. Storage, control and disposal of sources of radiation.
d. Inspection and maintenance of equipment.
4. The requirements of pertinent state and federal regulations.
5. Case histories of accidents in industrial radiography.

Note: A current list of state and national organizations administering the certification examination may be obtained by writing the Department at: Department of Health and Family Services, Radiation Protection Section, P.O. Box 2659, Madison, WI 53701−2659 or from the following website http://dhfs.wisconsin.gov/dph_beh/RadiatioP/IRCerts.htm.

(b) A licensee or registrant may not permit any individual to act as a radiographer until the individual has accomplished all the following:
1. Received copies of and instruction in the requirements described in this subchapter and applicable sections of subchs. III, X and XIII, the license under which the radiographer will perform industrial radiography and the licensee's or registrant's operating and emergency procedures.
2. Demonstrated an understanding of the licensee's license and operating and emergency procedures by successful completion of a written or oral examination covering this material.
3. Received training in the use of the registrant's radiation machines or the licensee's radiographic exposure devices, sealed sources, in the daily inspection of devices and associated equipment and in the use of radiation survey instruments.
4. Demonstrated understanding of the use of the equipment described in subd. 3. by successful completion of a practical examination.
(c) A licensee or registrant may not permit any individual to act as a radiographer's assistant until the individual has accomplished all the following:
1. Received copies of and instruction in the requirements described in this subchapter and applicable sections of subchs. III, X and XIII, the license under which the radiographer's assistant will perform industrial radiography and the licensee's or registrant's operating and emergency procedures.
2. Demonstrated an understanding of items in subd. 1. by successful completion of a written or oral examination.
3. Under the personal supervision of a radiographer, received training in the use of the registrant's radiation machines or the licensee's radiographic exposure devices and sealed sources, in the daily inspection of devices and associated equipment and in the use of radiation survey instruments.
4. Demonstrated an understanding of the use of the equipment described in subd. 3. by successful completion of a practical examination.
(d) A licensee or registrant shall provide annual refresher safety training for each radiographer and radiographer's assistant at intervals not to exceed 12 months.
(e) The radiation safety officer or designee shall conduct an inspection program of the job performance of each radiographer and radiographer's assistant to ensure that the department's rules, license requirements and operating and emergency procedures are followed. The department may consider alternatives in those situations where the individual serves as both radiographer and radiation safety officer. An inspection program is not required when a single individual serves as both radiographer and radiation safety officer and performs all radiography operations. The inspection program shall include all the following:
1. Observation of the performance of each radiographer and radiographer's assistant at intervals not to exceed 6 months during an actual industrial radiographic operation.
2. Provide that, if a radiographer or a radiographer's assistant has not participated in an industrial radiographic operation for more than 6 months since the last inspection, the radiographer shall demonstrate knowledge of the training requirements of par. (b) 3. and the radiographer's assistant shall demonstrate knowledge of the training requirements of par. (c) 3. by a practical examination before these individuals may next participate in a radiographic operation.
(f) A licensee or registrant shall maintain records under s. HFS 157.45 (9) of the training specified in this section to include certification documents, written oral and practical examinations, refresher safety training and inspections of job performance.

(4) OPERATING AND EMERGENCY PROCEDURES.

(a) Operating and emergency procedures shall include instructions in all the following:
1. Appropriate handling and use of sources of radiation so that no person is likely to be exposed to radiation doses in excess of the limits established in subch. III.
2. Methods and occasions for conducting radiation surveys.
3. Methods for posting signs in and controlling access to radiographic areas.
4. Methods and occasions for locking and securing sources of radiation.
5. Personnel monitoring and the use of personnel monitoring equipment.
6. Transporting equipment to field locations, including packing of radiographic exposure devices and storage containers in the vehicles, placarding of vehicles when required and control of the equipment during transportation as described in subch. XIII.
7. The inspection, maintenance and operability checks of radiographic exposure devices, radiation machines, survey instruments, alarming ratemeters, transport containers and storage containers.
8. Measures to be taken immediately by radiography personnel in the event a pocket dosimeter is found to be off−scale or an alarming ratemeter alarms unexpectedly.
9. The procedure or procedures for identifying and reporting defects and noncompliance as required by s. HFS 157.46.
10. The procedure for notifying the proper persons in the event of an accident or radiation incident.
11. Minimizing exposure of persons in the event of an accident or radiation incident, including a source disconnect, a transport accident or loss of a source of radiation.
12. Source recovery procedure if licensee will perform source recoveries.
13. Maintenance of records.
(b) The licensee or registrant shall maintain copies of current operating and emergency procedures under s. HFS 157.45 (10) and (14).

(5) SUPERVISION OF RADIOGRAPHER'S ASSISTANTS. (a) A radiographer's assistant shall be personally supervised by a radiographer when the assistant is using radiographic exposure devices, associated equipment or a sealed source or while conducting radiation surveys required by sub. (7) (b) to determine that the sealed source has returned to the shielded position or the radiation machine is off after an exposure. The personal supervision shall include all the following:
1. The radiographer's physical presence at the site where the sources of radiation are being used.
2. The availability of the radiographer to give immediate assistance if required.
3. The radiographer's direct observation of the assistant's performance of the operations referred to in this section.

(6) PERSONNEL MONITORING.
(a) A licensee or registrant may not permit any individual to act as a radiographer or a radiographer's assistant unless, at all times during radiographic operations, each individual wears on the trunk of his or her body a combination of direct reading dosimeter, an alarming ratemeter and a personnel dosimeter that is processed and evaluated by an accredited National Voluntary Laboratory Accreditation Program processor. At permanent radiographic installations where other appropriate alarming or warning devices are in routine use or during radiographic operations using radiation machines, the use of an alarming ratemeter is not required.
1. Pocket dosimeters shall have a range from zero to 2 millisieverts (200 mrem) and shall be recharged at the start of each shift. Electronic personal dosimeters may only be used in place of ion−chamber pocket dosimeters.
2. Each personnel dosimeter shall be assigned to and worn by only one individual.
3. Personnel dosimeters shall be exchanged at periods not to exceed one month.
4. After replacement, each personnel dosimeter shall be returned to the supplier for processing within 14 calendar days of the end of the monitoring period or as soon as practicable. In circumstances that make it impossible to return each personnel dosimeter in 14 calendar days, the circumstances shall be documented and available for review by the department.
(b) Direct reading dosimeters such as pocket dosimeters or electronic personal dosimeters, shall be read and the exposures recorded at the beginning and end of each shift and records shall be maintained as specified under s. HFS 157.45 (11)
(c) Pocket dosimeters or electronic personal dosimeters shall be checked at periods not to exceed 12 months for correct response to radiation and records shall be maintained as specified under s. HFS 157.45 (11). Acceptable dosimeters shall read within plus or minus 20% of the true radiation exposure.
(d) If an individual's pocket dosimeter is determined to be off−scale or the electronic personal dosimeter reads greater than 2 millisieverts (200 mrem), the individual's film badge, TLD or similar approved device shall be sent for processing within 24 hours. In addition, the individual may not resume work associated with the use of sources of radiation until a determination of the individual's radiation exposure has been made. The determination shall be made by the radiation safety officer or the radiation safety officer's designee. The results of the determination shall be included in the records maintained under s. HFS 157.45 (11).
(e) If a personnel dosimeter is lost or damaged, the worker shall cease work immediately until a replacement personnel dosimeter is provided and the exposure is calculated for the time period from issuance to loss or damage. The results of the calculated exposure and the time period for which the personnel dosimeter was lost or damaged shall be included in the records maintained as specified under s. HFS 157.45 (11).

(f) Dosimetry reports received from the accredited National Voluntary Laboratory Accreditation Program personnel dosimeter processor shall be retained as specified under s. HFS 157.45 (11).
(g) Each alarming ratemeter shall meet all the following criteria:
1. Checked to ensure that the alarm functions properly before using at the start of each shift.
2. Set to give an alarm signal at a preset dose rate of 5 millisieverts (500 mrem) per hour; with an accuracy of plus or minus 20% of the true radiation dose rate.
3. Require special means to change the preset alarm function.
4. Calibrated at periods not to exceed 12 months for correct response to radiation. A licensee shall maintain records of alarming ratemeter calibrations as specified under s. HFS 157.45 (11).
(7) RADIATION SURVEYS. A licensee or registrant shall do all the following:
(a) Conduct all surveys with a calibrated and operable radiation survey instrument that meets the requirements of s. HFS 157.38.
(b) Conduct a survey of the radiographic exposure device and the guide tube after each exposure when approaching the device or the guide tube. The survey shall determine that the sealed source has returned to its shielded position before exchanging films, repositioning the exposure head or dismantling equipment. Radiation machines shall be surveyed after each exposure to determine that the machine is off.
(c) Conduct a survey of the radiographic exposure device whenever the source is exchanged and whenever a radiographic exposure device is placed in a storage area to ensure that the sealed source is in its shielded position.
(d) Maintain records as specified under s. HFS 157.45 (12).
(8) SURVEILLANCE. During each radiographic operation, the radiographer shall ensure continuous direct visual surveillance of the operation to protect against unauthorized entry into a radiation area or a high radiation area as defined in subchapter I, except at permanent radiographic installations where all entryways are locked and the other requirements of this subchapter are met.
(9) POSTING. All areas in which industrial radiography is being performed shall have conspicuous signs posted as required under s. HFS 157.29 (2). The exceptions listed in s. HFS 157.29 (3) do not apply to industrial radiographic operations.
History: CR 01−108: cr. Register July 2002 No. 559, eff. 8−1−02; correction in (3) (a) (intro.) made under s. 13.93 (2m) (b) 7., Stats., Register July 2002 No. 559; **CR 06−021: am. (3) (b) 2., (6) (a) (intro.), 2. to 4., (e), (f), (g) 3. Register October 2006 No. 610, eff. 11−1−06**.

HFS 157.45 Recordkeeping requirements.

(1) RECORDS FOR INDUSTRIAL RADIOGRAPHY. A licensee or registrant shall maintain a copy of the license or registration, documents incorporated by reference and amendments to each of these items until superseded by new documents approved by the department or until the department terminates the license or registration.
(2) RECORDS OF RECEIPT AND TRANSFER OF SOURCES OF RADIATION.
(a) A licensee or registrant shall maintain records showing the receipts and transfers of sealed sources, devices using depleted uranium for shielding and radiation machines and retain each record for 3 years after the record is created.
(b) The records shall include the date, the name of the individual making the record, radionuclide, number of becquerels (curies) or mass and manufacturer, model and serial number of each source of radiation and device, as appropriate.
(3) RECORDS OF RADIATION SURVEY INSTRUMENTS. A licensee or registrant shall maintain records of the calibrations of its radiation survey instruments that are required under s. HFS 157.38 and retain each record for 3 years after the record is created.
(4) RECORDS OF LEAK TESTING OF SEALED SOURCES AND DEVICES CONTAINING DU. A licensee shall maintain records of leak test results for sealed sources and for devices containing DU. The results shall be stated in units of becquerels or μCi. A licensee shall retain each record for 3 years after the record is made or until the source in storage is removed.
(5) RECORDS OF QUARTERLY INVENTORY.
(a) A licensee shall maintain records of the quarterly inventory of sources of radiation, including devices containing depleted uranium as required by s. HFS 157.40 and retain each record for 3 years.
(b) The record shall include the date of the inventory, name of the individual conducting the inventory, radionuclide, number of becquerels (curies) or mass in each device, location of sources of radiation and devices and manufacturer, model and serial number of each source of radiation or device, as appropriate.
(6) UTILIZATION LOGS.
(a) A licensee or registrant shall maintain utilization logs showing for each source of radiation all the following information:
1. A description, including the make, model and serial number of the radiation machine or the radiographic exposure device, transport or storage container in which the sealed source is located.
2. The identity and signature of the radiographer to whom the radiation source is assigned.
3. The location and dates of use, including the dates removed and returned to storage.
4. For permanent radiographic installations, the dates each radiation machine is energized.
(b) A licensee or registrant shall retain the logs required by par. (a) for 3 years.
(7) RECORDS OF INSPECTION AND MAINTENANCE OF RADIATION MACHINES, RADIOGRAPHIC EXPOSURE DEVICES, TRANSPORT AND STORAGE CONTAINERS, ASSOCIATED EQUIPMENT, SOURCE CHANGERS AND SURVEY INSTRUMENTS.

(a) A licensee or registrant shall maintain records specified in s. HFS 157.41 of equipment problems found in daily checks and quarterly inspections of radiation machines, radiographic exposure devices, transport and storage containers, associated equipment, source changers and survey instruments and retain each record for 3 years after it is made.
(b) The record shall include the date of check or inspection, name of inspector, equipment involved, any problems found and what repair and maintenance, if any, was performed.
(8) RECORDS OF ALARM SYSTEM AND ENTRANCE CONTROL CHECKS AT PERMANENT RADIOGRAPHIC INSTALLATIONS. A licensee or registrant shall maintain records of alarm system and entrance control device tests required by s. HFS 157.42 and retain each record for 3 years after it is made.
(9) RECORDS OF TRAINING AND CERTIFICATION.
(a) A licensee or registrant shall maintain the following records for 3 years:
1. Records of training of each radiographer and each radiographer's assistant. The record shall include radiographer certification documents and verification of certification status, copies of written tests, dates of oral and practical examinations, the names of individuals conducting and receiving the oral and practical examinations and a list of items tested and the results of the oral and practical examinations.
2. Records of continuing education safety training and semi−annual inspections of job performance for each radiographer and each radiographer's assistant. The records shall list the topics discussed during the safety training, the dates the continuing education safety training was conducted and names of the instructors and attendees. For inspections of job performance, the records shall also include a list showing the items checked and any non−compliance observed by the radiation safety officer or designee.
(10) COPIES OF OPERATING AND EMERGENCY PROCEDURES. A licensee or registrant shall maintain a copy of current operating and emergency procedures until the department terminates the license or registration. Superseded material shall be retained for 3 years after the change is made.
(11) RECORDS OF PERSONNEL MONITORING. A licensee or registrant shall maintain all the following exposure records as specified in s. HFS 157.44 (6):
(a) Direct reading dosimeter readings and yearly operability checks required by s. HFS 157.44 (6) (b) and (c) for 3 years after the record is created.
(b) Records of alarming ratemeter calibrations for 3 years after the record is created.
(c) Personnel dosimeter results received from the accredited National Voluntary Laboratory Accreditation Program processor until the department terminates the license or registration.
(d) Records of estimates of exposures as a result of off−scale personal direct reading dosimeters or lost or damaged film badges, TLD's or similar approved devices until the department terminates the license or registration.
(12) RECORDS OF RADIATION SURVEYS.. A licensee shall maintain a record of each exposure device survey conducted before the device is placed in storage as specified in s. HFS 157.44 (7) (c). Each record shall be maintained for 3 years after it is made.
(13) FORM OF RECORDS. Each record required by this subchapter shall be legible throughout the specified retention period. The record may be the original, a reproduced copy, microform, or electronic storage provided the copy or microform is authenticated by authorized personnel and the microform or electronic copy is capable of reproducing a clear reproduction throughout the required retention period. Records, such as letters, drawings and specifications, shall include all pertinent information, such as stamps, initials and signatures. A licensee or registrant shall maintain adequate safeguards against tampering with and loss of records.
(14) LOCATION OF DOCUMENTS AND RECORDS. A licensee or registrant shall maintain copies of all the following documents:
(a) Records required by this subchapter and other applicable subchapters at the location specified in s. HFS 157.13 (6) (k).
(b) Current copies of the following, sufficient to demonstrate compliance, at each applicable field station and each temporary jobsite:
1. The license or registration authorizing the use of sources of radiation.
2. A copy of this subchapter and subchs. I, III and X.
3. Utilization logs for each source of radiation dispatched from that location as required under sub. (6).
4. Records of equipment problems identified in daily checks of equipment as required under sub. (7) (a).
5. Records of alarm system and entrance control checks required under sub. (8), if applicable.
6. Records of direct reading dosimeters such as pocket dosimeters or electronic personal dosimeters readings as required under sub. (11).
7. Operating and emergency procedures as required under sub. (10).
8. Evidence of the latest calibration of the radiation survey instruments in use at the site, as required under sub. (3).
9. Evidence of the latest calibrations of alarming ratemeters and operability checks of dosimeters as required under sub. (11).
10. Survey records as required under sub. (12) and s. HFS 157.31 (4) as applicable for the period of operation at the site.
11. The shipping papers for the transportation of radioactive materials required under subch. XIII.

12. When operating under reciprocity under subch. II, a copy of the applicable state or nuclear regulatory commission license authorizing the use of sources of radiation.
History: CR 01−108: cr. Register July 2002 No. 559, eff. 8−1−02; **CR 06−021:am. (11) (c), r. and recr. (14) (b) 6. Register October 2006 No. 610, eff. 11−1−06**.

HFS 157.46 Notifications.

(1) WRITTEN REPORTS. In addition to the reporting requirements specified in 10 CFR 30.50 and in subch. III, a licensee or registrant shall provide a written report to the department within 30 days of the occurrence of any of the following incidents involving radiographic equipment:
(a) Unintentional disconnection of the source assembly from the control cable.
(b) Inability to retract the source assembly to its fully shielded position and secure it in its retracted position.
(c) Failure of any component which is critical to safe operation of the device to properly perform its intended function.
(d) An indicator on a radiation machine fails to show that radiation is being produced, an exposure switch fails to terminate production of radiation when turned to the off position or a safety interlock fails to terminate x−ray production.
(2) REPORTING REQUIREMENTS. A licensee or registrant shall include all the following information in each report submitted under sub. (1) and in each report of overexposure submitted under s. HFS 157.32 (3) which involves failure of safety components of radiography equipment:
(a) Description of the equipment problem.
(b) Cause of each incident, if known.
(c) Name of the manufacturer and model number of equipment involved in the incident.
(d) Place, date and time of the incident.
(e) Actions taken to establish normal operations.
(f) Corrective actions taken or planned to prevent recurrence.
(g) Names and qualifications of personnel involved in the incident.
(3) UNLISTED SITE. A licensee or registrant conducting radiographic operations or storing sources of radiation at any location not listed on the license or registration for a period in excess of 180 days in a year shall notify the department prior to exceeding the 180 days.
History: CR 01−108: cr. Register July 2002 No. 559, eff. 8−1−02.

HFS 157.47 Reciprocity.

(1) LICENSES. All reciprocal recognition of licenses by the department shall be granted under subch. II.
(2) CERTIFICATION.
(a) The department shall grant reciprocal recognition of an individual radiographer certification provided that all the following apply:
1. The individual holds a valid certification issued by an independent certifying organization or agreement state that meets the criteria in 10 CFR 34 Appendix A.
2. The requirements and procedures of the certifying entity issuing the certification affords the same or comparable certification standards as those afforded by s. HFS 157.44 (3) (a).
3. The applicant presents the certification to the department prior to entry into the state.
4. No escalated enforcement action against the individual is pending with the nuclear regulatory commission or in any other state.
(b) A certified individual who is granted reciprocity by the department shall maintain the certification upon which the reciprocal recognition was granted or prior to the expiration of the certification shall meet the requirements of s. HFS 157.44 (3) (a).
History: CR 01−108: cr. Register July 2002 No. 559, eff. 8−1−02.

HFS 157.48 Specific requirements for radiographic personnel performing industrial radiography.

1) JOB SITE REQUIREMENTS. At a job site, a licensee or registrant shall supply all the following:
(a) At least one operable, calibrated survey instrument for each exposure device or radiation machine in use.
(b) A current whole body personnel monitor, TLD, film badge or similar approved device for each person performing radiographic operations.
(c) An operable, calibrated pocket dosimeter with a range of zero to 200 milliroentgens for each person performing radiographic operations.
(d) An operable, calibrated, alarming ratemeter for each person performing radiographic operations using a radiographic exposure device.
(e) Barrier ropes and signs as required in subch. III.
(2) PROOF OF CERTIFICATION. Each radiographer at a job site shall carry on their person a valid certification ID card issued by a certifying entity.
(3) PROHIBITION. Industrial radiographic operations may not be performed if any of the items in subs. (1) and (2) are not available at the job site or are inoperable.

(4) TERMINATION OF OPERATION. During an inspection, the department may terminate an operation if any of the items in sub. (1) or (2) are not available or inoperable or if the required number of radiographic personnel are not present. Operations may not resume until all required conditions are met.

History: CR 01−108: cr. Register July 2002 No. 559, eff. 8−1−02.